MUNICIPAL SOLID WASTE IN THE UNITED STATES: 1999 FACTS AND FIGURES

Executive Summary

OVERVIEW

This report describes the national municipal solid waste (MSW) stream based on data collected from 1960 through 1999. The historical perspective is useful for establishing trends in types of MSW generated and in the ways it is managed. In this Executive Summary, we briefly describe the methodology used to characterize MSW in the United States, and provide the latest facts and figures on MSW generation, source reduction, recycling, and disposal. Details regarding the characterization of municipal solid waste are presented in Chapters 2 through 4.

In this report, we are providing estimates for source reduction (waste prevention) for the first time. Also, we are providing additional detail on generation, recycling, and disposal of consumer electronics products. This consumer electronics information is briefly summarized in the Executive Summary and in Chapter 2, with additional detail in Appendix B.

In the United States, we generated approximately 229.9 million tons of MSW in 1999 – an increase of 6.9 million tons from 1998. This is about a 3 percent increase in waste generation from 1998. Excluding composting, the amount of MSW recycled increased to 50.8 million tons, an increase of 2.4 million tons. This is a 5 percent increase in the tons recycled since 1998. The tons recovered for recycling (including composting) rose to 64 million tons in 1999, up from 62 million tons in 1998. The recovery rate for recycling (including composting) was 27.8 percent in 1999, up from 27.6 percent in 1998. (See Tables ES-1 and ES-2 and Figures ES-1 and ES-2).

* Data shown for 1998 has been adjusted to reflect the latest revisions to the data and methodology and, therefore, may differ slightly from the same measure reported previously. For instance, the recycling rate for 1998 was revised from last year's report, to equal 27.6 percent.

Table ES-1
GENERATION, MATERIALS RECOVERY, COMPOSTING,
AND DISCARDS OF MUNICIPAL SOLID WASTE, 1960-1999
(In millions of tons)

Millions of Tons									
	1960	1970	1980	1990	1994	1995	1997	1998	1999
Generation	88.1	121.1	151.6	205.2	214.4	211.4	219.1	223.0	229.9
Recovery for recycling	5.6	8.0	14.5	29.0	42.2	45.3	47.3	48.4	50.8
Recovery for composting*	Neg.	Neg.	Neg.	4.2	8.5	9.6	12.1	13.1	13.1
Total Materials Recovery	5.6	8.0	14.5	33.2	50.6	54.9	59.4	61.6	63.9
Discards after Recovery	82.5	113.0	137.1	172.0	163.7	156.5	159.8	161.5	166

* Composting of yard trimmings and food wastes. Does not include mixed MSW composting or backyard composting.
Source: Franklin Associates

Table ES-2
GENERATION, MATERIALS RECOVERY, COMPOSTING,
AND DISCARDS OF MUNICIPAL SOLID WASTE, 1960-1999
(In pounds per person per day)

Pounds per Person per Day									
	1960	1970	1980	1990	1994	1995	1997	1998	1999
Generation	2.68	3.25	3.66	4.50	4.51	4.40	4.49	4.52	4.62
Recovery for recycling	0.17	0.22	0.35	0.64	0.89	0.94	0.97	0.98	1.02
Recovery for composting*	Neg.	Neg.	Neg.	0.09	0.18	0.20	0.25	0.27	0.26
Total Materials Recovery	0.17	0.22	0.35	0.73	1.06	1.14	1.22	1.25	1.28
Discards after Recovery	2.51	3.04	3.31	3.77	3.44	3.26	3.27	3.27	3.33
Population (thousands)	179,979	203,984	227,255	249,907	260,682	263,168	267,645	270,561	272,691

*Composting of yard trimmings and food wastes. Does not include mixed MSW composting or backyard composting.
Details may not add to totals due to rounding.
Source: Franklin Associates

MSW generation in 1999 rose to 4.62 pounds per person per day, up from 4.52 pounds per person per day in 1998. This is an increase of 0.1 pounds per person per day compared to 1998. The recycling rate in 1999 was 1.28 pounds per person per day, up from 1.25 in 1998. Discards after recycling rose to 3.33 from the 1998 value of 3.27 pounds per person per day (Table ES-3).

Table ES-3
GENERATION, MATERIALS RECOVERY, COMPOSTING,
AND DISCARDS OF MUNICIPAL SOLID WASTE, 1960-1999
(In percent of total generation)

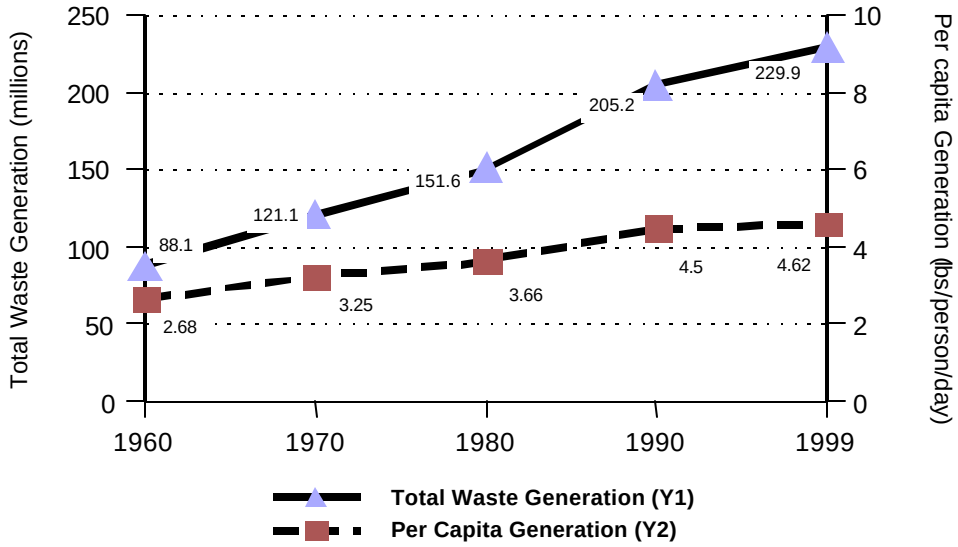
Percent of Total Generation									
	1960	1970	1980	1990	1994	1995	1997	1998	1999
Generation	100.0 %	100.0 %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Recovery for recycling	6.4%	6.6%	9.6%	14.2%	19.7%	21.5%	21.6%	21.7%	22.1%
Recovery for composting*	Neg.	Neg.	Neg.	2.0%	4.0%	4.5%	5.5%	5.9%	5.7%
Total Materials Recovery	6.4%	6.6%	9.6%	16.2%	23.6%	26.0%	27.1%	27.6%	27.8%
Discards after Recovery	93.6%	93.4%	90.4%	83.8%	76.4%	74.0%	72.9%	72.4%	72.2%

*Composting of yard trimmings and food wastes. Does not include mixed MSW composting or backyard composting.
Details may not add to totals due to rounding.
Source: Franklin Associates

The state of the economy has a direct impact on consumption and waste generation. With the strong economic growth that has occurred throughout the 1990s, waste generation has continued to increase. Source reduction efforts have helped to dampen the increases in waste generation. On-site yard waste composting, use of mulching mowers, and reductions in the weight of beverage containers have been the main reasons for this success.

Using a baseline year of 1990, and comparing the actual waste generation to what the waste generation would have been without source reduction, in 1999 about 50 million tons of waste was prevented, or source reduced. In 1999 229.9 million tons of MSW were generated. Therefore, had this level of source reduction not occurred, 22 percent more MSW would have been generated.

Figure ES-1: Waste Generation Rates From 1960 to 1999



WHAT IS INCLUDED IN MUNICIPAL SOLID WASTE?

MSW – otherwise known as trash or garbage – consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries. Not included are materials that also may be disposed in landfills, but are not generally considered MSW, such as construction and demolition debris, municipal wastewater treatment sludges, and non-hazardous industrial wastes.

MUNICIPAL SOLID WASTE IN PERSPECTIVE

Trends Over Time

Over the last few decades, the generation, recycling, and disposal of MSW has changed substantially (see Tables ES-1, ES-2, and ES-3 and Figures ES-1 and ES-2). MSW generation has continued to increase from 1960, when it was 88 million tons per year. The generation rate in 1960 was just 2.7 pounds per person per day; it grew to 3.7 pounds per person per day in 1980; reached 4.5 pounds per person per day in 1990; and is now 4.62 pounds per person per day.

Waste generation rates would be even higher, if not for waste prevention practices such as on-site composting, leaving grass clippings on the lawn, and lightweighting of packaging materials. Generation of yard trimmings during 1999 is estimated at 27.7 million tons, down from 35 million tons in 1990 (Table ES-4). Source reduction of MSW increased from 630,000 tons in 1992 to 50 million tons in 1999. This is explained further at the end of this Executive Summary and in Chapter 4.

Over time, recycling rates have increased from 10 percent of the MSW generated in 1980 to 16 percent in 1990, to the current 28 percent. Disposal has decreased from 90 percent of the amount generated in 1980 to 72.2 percent of MSW in 1999. This compares to 72.4 percent in 1998.

Figure ES-2: Waste Recycling Rates From 1960 to 1999

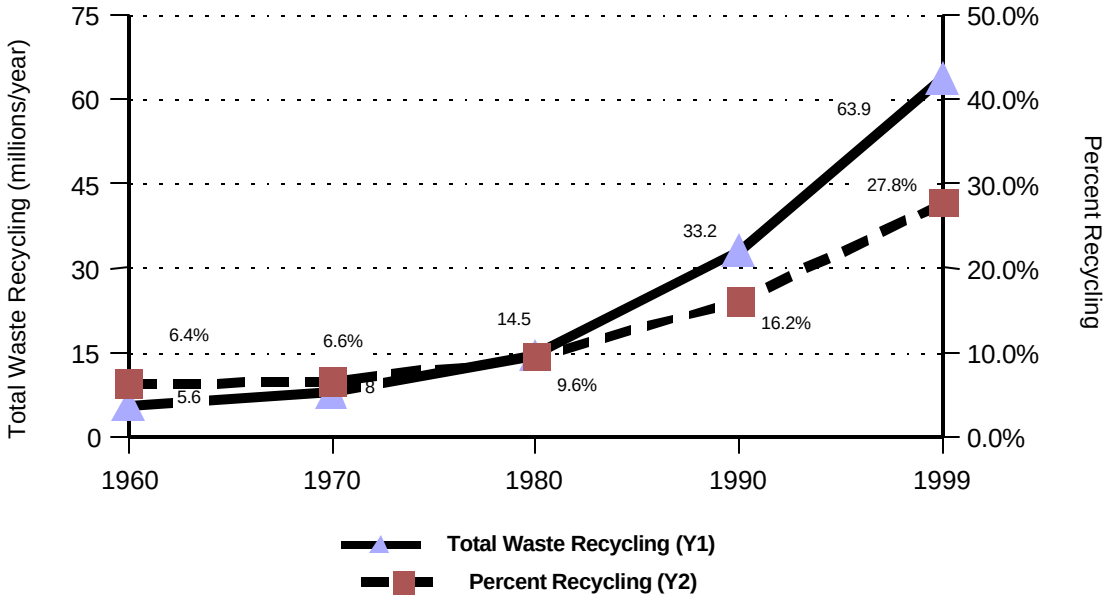


Table ES-4
GENERATION AND RECOVERY OF MATERIALS IN MSW, 1999
(In millions of tons and percent of generation of each material)

	Weight Generated	Weight Recovered	Recovery as a Percent of Generation
Paper and paperboard	**87.5**	**36.7**	**41.9%**
Glass	**12.6**	**2.9**	**23.4%**
Metals			
Steel	**13.3**	**4.5**	**33.6%**
Aluminum	**3.1**	**0.9**	**27.8%**
Other nonferrous metals*	**1.4**	**0.9**	**66.9%**
Total metals	**17.8**	**6.3**	**35.2%**
Plastics	**24.2**	**1.4**	**5.6%**
Rubber and leather	**6.2**	**0.8**	**12.7%**
Textiles	**9.1**	**1.2**	**12.9%**
Wood	**12.3**	**0.7**	**5.9%**
Other materials	**4.0**	**0.9**	**21.4%**
Total Materials in Products	**173.6**	**50.8**	**29.3%**
Other wastes			
Food, other**	**25.2**	**0.6**	**2.2%**
Yard trimmings	**27.7**	**12.6**	**45.3%**
Miscellaneous inorganic wastes	**3.4**	**Neg.**	**Neg.**
Total Other Wastes	**56.3**	**13.1**	**23.3%**
TOTAL MUNICIPAL SOLID WASTE	**229.9**	**63.9**	**27.8%**

Includes Wastes from residential, commercial, and institutional sources.
*Includes lead from lead-acid batteries.
**Includes recovery of paper for composting.
Neg.= Less than 50,000 tons or 0.05 percent.

MUNICIPAL SOLID WASTE IN 1999

EPA has two ways of analyzing the 229.9 million tons of MSW generated in 1999. The first is by **material** (paper and paperboard, yard trimmings, food scraps, plastics, metals, glass, wood, rubber, leather and textiles, and other), and the second is by several major **product** categories. The product-based categories are containers and packaging; nondurable goods (e.g.,

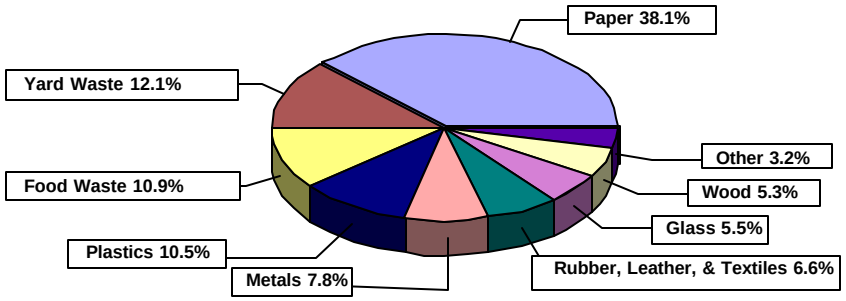
newspapers); durable goods (e.g., appliances); yard trimmings; food scraps; and other materials.

Materials in MSW

Figure ES-3 provides a breakdown, by weight, of the MSW **materials** generated in 1999. Paper and paperboard products made up the largest component of MSW generated (38 percent), and yard trimmings comprised the second-largest material component (12 percent). Glass, metals, plastics, wood, and food wastes each constituted between 5 and 11 percent of the total MSW generated. Rubber, leather, and textiles combined made up about 7 percent of MSW, while other miscellaneous wastes made up approximately 2 percent of the MSW generated in 1999.

A portion of each **material category** in MSW was recycled or composted in 1999. The highest rates of recycling were achieved with yard trimmings, metals and paper. About 45 percent (12.6 million tons) of yard trimmings were recovered for composting in 1999. This represents more than a three-fold increase since 1990. About 42 percent (37 million tons) of paper and paperboard were recovered for recycling in 1999. Recycling of these organic materials alone diverted over 21 percent of municipal solid waste from landfills and incineration.

Figure ES-3: 1999 Total Waste Generation - 230 Million Tons
(Before Recycling)



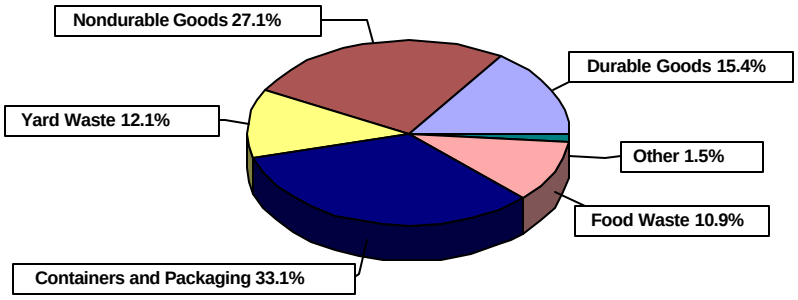
Percent of total generation and millions of tons generated in 1999

In addition, about 6.3 million tons of metals were recovered for recycling, or 35 percent. Table ES-4 lists the recycling rates for 1999 for all of the materials categories.

Products in MSW

Figure ES-4 shows the breakdown, by weight, of **product categories** generated in 1999. Containers and packaging comprised the largest portion of products generated, at 33 percent (76 million tons) of total MSW generation. Nondurable goods were the second-largest fraction, comprising about 27 percent (62 million tons). The third-largest category of products is durable goods, which comprised 15.4 percent (35 million tons) of total MSW generation.

Figure ES-4: Products Generated in MSW - 1999
(Total Weight = 230 million tons)



Percent of total generation and millions of tons generated in 1999

Table ES-5 shows the generation and recovery of the **product** categories in MSW. This table shows that recovery of *containers and packaging* was the highest of the three product categories – 37 percent of containers and packaging generated in 1999 was recovered for recycling. About 44 percent of aluminum packaging was recovered (mostly beverage cans), while 57 percent of steel packaging (mostly cans) was recovered. Paper and paperboard packaging recovery was estimated at 51 percent; corrugated containers accounted for most of that figure.

Table ES-5

GENERATION AND RECOVERY OF PRODUCTS IN MSW

BY MATERIAL, 1999

(In millions of tons and percent of generation of each product)

	Weight Generated	Weight Recovered	Recovery as a Percent of Generation
Durable goods			
Ferrous metals	10.4	2.8	26.9%
Aluminum	1.0	Neg.	Neg.
Other non-ferrous metals	1.4	0.9	66.9%
Total metals	12.8	3.7	29.3%
Glass	1.5	Neg.	Neg.
Plastics	7.2	0.3	3.8%
Rubber and leather	5.4	0.8	14.6%
Wood	4.7	Neg.	Neg.
Textiles	2.7	0.2	8.7%
Other materials	1.1	0.9	76.8%
Total durable goods	35.4	5.9	16.6%
Nondurable goods			
Paper and paperboard	46.3	15.7	33.9%
Plastics	5.8	Neg.	Neg.
Rubber and leather	0.8	Neg.	Neg.
Textiles	6.2	0.9	15.1%
Other materials	3.1	Neg.	Neg.
Total nondurable goods	62.2	16.6	26.8%
Containers and packaging			
Steel	2.9	1.7	57.3%
Aluminum	2.0	0.9	44.2%
Total metals	4.9	2.6	52.0%
Glass	11.1	2.9	26.6%
Paper and paperboard	41.2	21.0	51.0%
Plastics	11.2	1.1	9.7%
Wood	7.5	0.7	9.5%
Other materials	0.2	Neg.	Neg.
Total containers and packaging	76.0	28.3	37.2%
Other wastes			
Food wastes	25.2	0.6*	2.2%
Yard trimmings	27.7	12.6	45.3%
Miscellaneous inorganic wastes	3.4	Neg.	Neg.
Total other wastes	56.3	13.1	23.3%
TOTAL MUNICIPAL SOLID WASTE	229.9	63.9	27.8%

Includes wastes from residential, commercial, and institutional sources.

*Includes recovery of paper for composting.

Neg. = less than 50,000 tons or 0.05 percent.

Approximately 27 percent of glass containers was recovered overall, while about 10 percent of wood packaging (mostly pallets removed from service) was recovered for recycling. About 10 percent of plastic containers and packaging was recovered in 1999, mostly soft drink, milk, and water bottles.

Overall recovery of *nondurable goods* was 26.8 percent in 1999. The increase in recovery of paper and paperboard products has been due to increases in recovery, over time, from all categories. Newspapers constituted the largest portion of this recovery, with 59 percent of newspapers generated being recovered for recycling. Fifty-three percent of high-grade office papers and 23 percent of magazines were recovered in 1999.

Also within the *nondurable goods*, paper and paperboard category, key products whose recovery rose the most from 1997 to 1999 include directories, standard (A) mail*, and newspapers. In 1997, 12.8 percent of directories were recovered, which increased to 16.2 percent in 1999 (100,000 tons per year in 1999). Recovery of standard (A) mail has increased from 18.1 percent in 1997, to 22.1 percent in 1999 (1.2 million tons in 1999). Recovery of newspapers increased from 54 percent of newspapers in 1996 to 59 percent in 1999 (8.2 million tons in 1999.)

This year, selected consumer electronics, a new subcategory within *nondurable goods*, was measured for the first time. The "selected consumer electronics" category consists of video products such as TVs, VCRs and camcorders; audio products such as radios and some stereo systems; and information products such as telephones, personal computers, and computer monitors and printers. This "selected consumer electronics" category probably contains a major portion of consumer electronics, but it may underestimate generation of this category, because of data limitations**.

*Standard (A) mail was formerly called 3rd class mail by the U.S. Postal Service.

** "Selected consumer electronics," as a subset of *nondurable goods*, may be an underestimation because certain types of consumer electronics such as stereo systems made of components, were not included due to lack of sales data. In addition, there was limited data on consumer electronic products shipped directly from manufacturers (or their representatives) to large consumers. These products, though not included in "selected consumer electronics," are still included in the *nondurable goods* category.

In 1999, more than 400 million units of "selected consumer electronics" were shipped, up from less than 150 million units shipped in 1984. "Selected consumer electronics," compared with all MSW, resulted in 0.8 percent of the MSW generation; 0.3 percent of the recovery, and 1 percent of the discards. Recovery, which could be overestimated, was 0.1 percent for video products, 21 percent for information products, and negligible for audio products.

The nondurable category also includes clothing and other textile nondurable products – 15.2 percent of these were recovered for recycling in 1999.

Overall, *durable goods* were recovered at a rate of 16.6 percent in 1999. Nonferrous metals had one of the highest recovery rates, at 67 percent, due to the high rate of lead recovery from lead-acid batteries. Twenty-seven percent of ferrous metals were recovered from appliances and miscellaneous durable goods. Excluding retreads and tire-derived fuel use, more than 26 percent of tires also were recovered for recycling.

One of the products with particularly high recovery rates was lead-acid batteries, at 96.9 percent. Other products with particularly high recovery rates were corrugated boxes (65.1 percent), steel in major appliances (52.2 percent), steel cans (56.1 percent), aluminum beverage cans (54.5 percent) and newspapers (59 percent).

RESIDENTIAL AND COMMERCIAL SOURCES OF MSW

Sources of MSW, as characterized in this report, include both residential and commercial locations. We estimated residential waste (including waste from multi-family dwellings) to be 55 to 65 percent of total MSW generation. Commercial waste (including waste from schools, some industrial sites where packaging is generated, and businesses) constitutes between 35 and 45 percent of MSW. Local and regional factors, such as climate and level of commercial activity, contribute to these variations.

MANAGEMENT OF MSW

Overview

EPA's integrated waste management hierarchy includes the following three components,

listed in order of preference:

- Source reduction (or waste prevention), including reuse of products and on-site, or backyard composting of yard trimmings.
- Recycling, including off-site or community composting.
- Disposal, including waste combustion (preferably with energy recovery) and landfilling.

Although EPA encourages the use of strategies that emphasize the top of the hierarchy whenever possible, all three components remain important within an integrated waste management system.

Source Reduction

EPA has been measuring recycling rates for many years. When EPA established its waste management hierarchy in 1989, it emphasized the importance of *reducing* the amount of waste created, reusing whenever possible, and then recycling what is left. When municipal solid waste is reduced and reused, this is called "source reduction" – meaning the material never enters the waste stream. It is managed at the source of generation.

Source reduction, also called waste prevention, includes the design, manufacture, purchase, or use of materials, such as products and packaging, to reduce their amount or toxicity before they enter the MSW management system. Some examples of source reduction activities are:

- Designing products or packaging to reduce the quantity or the toxicity of the materials used, or to make them easy to reuse.
- Reusing existing products or packaging; for example, refillable bottles, reusable pallets, and reconditioned barrels and drums.
- Lengthening the lives of products such as tires to postpone disposal.
- Using packaging that reduces the amount of damage or spoilage to the product.
- Managing nonproduct organic wastes (e.g., food scraps, yard trimmings) through on-site composting or other alternatives to disposal (e.g., leaving grass clippings on the lawn).

EPA recently has been able to estimate source reduction for the nation based on national

production and disposal data. This has demonstrated some major successes in this area. In 1999, the U.S. prevented more than *50 million tons* of municipal solid waste from entering the waste stream.

Containers and packaging represent approximately 24 percent of the materials source reduced in 1999, in addition to nondurable goods (e.g., newspapers, clothing) at 18 percent, durable goods (e.g., appliances, furniture, tires) at 11 percent, and other MSW (e.g., yard trimmings, food scraps) at 47 percent.

As the nation has begun to realize the value of its resources, both financial and material, greater efforts have been made to reduce waste generation. Table ES-6 shows that steady progress has been made in waste prevention since 1990.

Table ES-6

Year	Tons Source Reduced
1992	**630,000**
1994	**7,974,000**
1995	**21,418,000**
1996	**23,286,000**
1997	**32,019,000**
1998	**40,319,000**
1999	**50,042,000**

Table ES-7 shows that almost half of the total waste prevented since 1990 comes from organic waste materials such as yard trimmings and food wastes. This is likely the result of many locally enacted bans on the disposal of yard waste from landfills around the country, as well as successful campaigns promoting backyard composting and mulching lawn mowers.

Table ES-7

1999 Source Reduction by Major Material Categories	
Waste Stream	**Tons Source Reduced**
Durable Goods (e.g. appliances, furniture)	**5,289,000**
Nondurable Goods (e.g. newspapers & clothing)	**8,956,000**
Containers & Packaging (e.g. bottles & boxes)	**12,004,000**
Other MSW (e.g. yard trimmings & food scraps)	**23,793,000**
Total Source Reduction (1990 baseline)	**50,042,000**

But there also have been several materials within the categories, above, whose disposal rates have increased. In particular, clothing and footwear show significant increased disposal rates, as do plastic containers. Some of the rise in plastics use can be attributed to the long-term trend of manufacturers substituting their glass packaging with plastic.

However, not all of these increases are due to material substitution. Much of this nation's increased waste generation is due to the booming economy of the 1990s. Americans now find themselves with a growing amount of discretionary spending dollars in their pockets after paying the mortgage or rent. As a result of this growth in Personal Consumption Expenditure (PCE) dollars, otherwise referred to as consumer spending, we have increasingly become a nation of consumers. The result is an increasing need for the disposal of municipal solid waste. Still, the United States has made progress in the area of waste reduction and reuse, as indicated by the 50 million tons of source reduction in 1999 (1990 baseline).

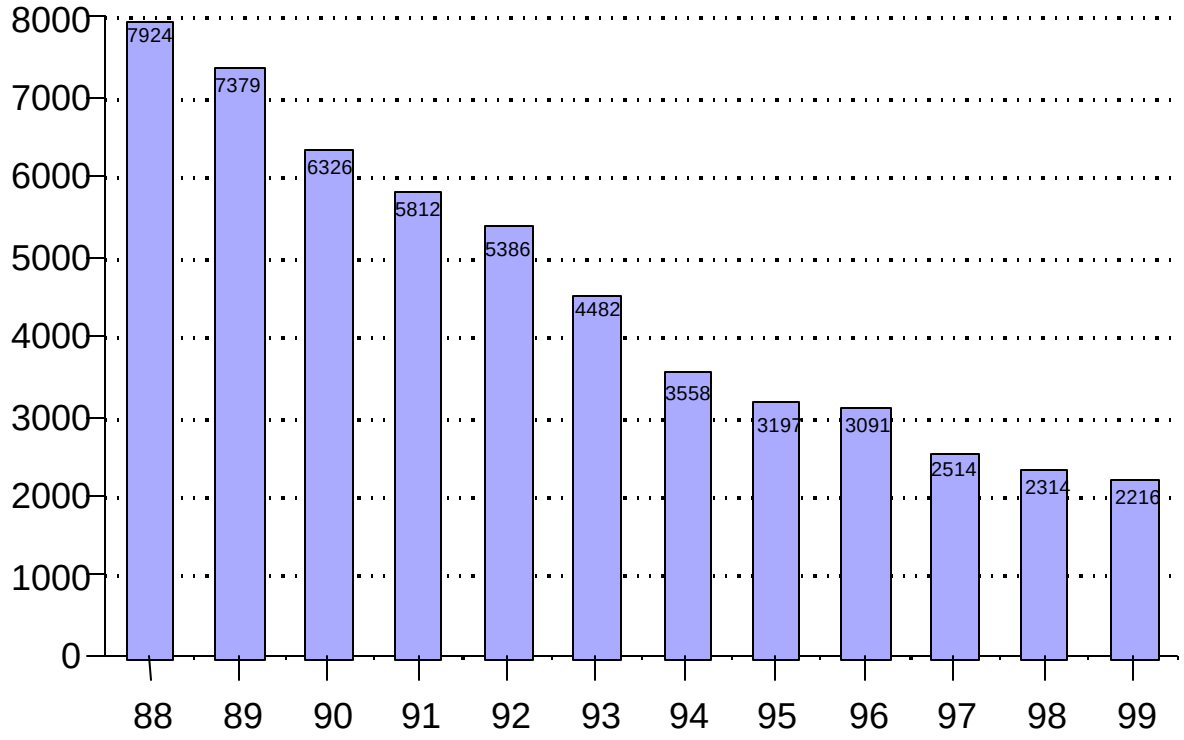
Recycling

- Recycling (including community composting) recovered 27.8 percent (63.9 million tons) of MSW in 1999.
- There were more than 9,300 curbside recycling programs in the United States in 1998. This is up from about 8,900 curbside recycling programs in 1997.
- About 3,800 yard trimmings composting programs were reported in 1998. This compared to about 3,500 yard trimmings composting programs reported in 1997.

Disposal

An estimated 14.8 percent of MSW was combusted in 1999, down from 15.4 percent in 1998.** During 1999, about 57.4 percent of MSW was landfilled. Figure ES-5 shows that the number of municipal solid waste landfills decreased substantially over the last 10 years, from nearly 8,000 in 1988 to 2,314 in 1998 to 2,216 in 1999 – while the average landfill size increased. At the national level, capacity does not appear to be a problem, although regional dislocations sometimes occur.

Figure ES-5: Number of Landfills in the U.S.



Source: *BioCycle* magazine, 1989-2000

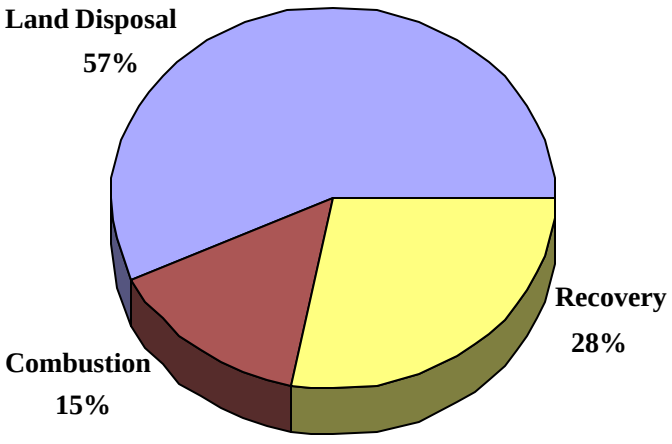
**Data shown for 1998 has been adjusted to reflect the latest revisions to data and methodology and therefore may differ slightly from the same measure reported previously. For instance the combustion fraction for 1998 was revised downward from last year's report, to equal 15.4 percent.

- As recovery rates have remained stable, and combustion decreased slightly**,** the percentage of MSW discarded to landfills increased slightly from 1997 to 1999. Over the long term, the tonnage landfilled rose from 123.4 million tons in 1980 to 131.9 million tons landfilled in 1999.

- The net per capita discard rate (after recovery for recycling) was 3.33 pounds per person per day in 1999, up slightly from 3.27 pounds per person per day in 1998 (Table ES-2).

Figure ES-6 shows MSW recovered for recycling (including composting) and disposed of by combustion and landfilling in 1999. In 1999, 63.9 million tons (27.8 percent) of MSW was recycled, 34 million tons was combusted (14.8 percent) and 131.9 million tons (57.4 percent) was landfilled. (Relatively small amounts of this total undoubtedly were littered or illegally dumped rather than landfilled.)

Figure ES-6: Management of MSW in the U.S.



PERSPECTIVE FOR THE NATION

As economic growth results in more products and materials being generated, there will be an increased need to invest in source reduction activities such as lightweighting of products and packaging, reuse of products, grasscycling, and backyard composting. Also important, will be utilizing existing recycling and composting facilities, further developing this infrastructure, and buying recycled products, to conserve resources and minimize our dependence on disposal through combustion and landfilling.

FOR FURTHER INFORMATION

This report and related additional data is available on the Internet at www.epa.gov/osw. Additional information on source reduction is available in *National Source Reduction Characterization Report for Municipal Solid Waste in the United States*, EPA530-R-99-034, November 1999.